each genus and species and of each author mentioned. The Bavarian Academy of Sciences, which has assisted in its publication, might well have increased its subvention if necessary to provide such an index.—C. R. B.

Speculative biology.

In 1875 Pflüger propounded a hypothesis regarding the constitution of organized bodies which may be described as the hypothesis of chemical continuity. Impressed with the extensive polymerization among carbon compounds, especially the proteids, he ventured the suggestion that in an organism polymerization may progress indefinitely, so that the whole protoplasm is not an aggregate of similar molecules having definite molecular weight but may form a single giant chemical molecule. This theory has found few adherents. It is accepted *in toto*, however, by Dr. Georg Hörmann, who proceeds in a recent book[3] to show its adequacy to explain certain biological problems, and, therefore, its inherent probability.

He applies it to the transmission of the impulse in nerve and the phenomena of nerve section; to the contraction of muscle and the discharge from the electric organs of fishes; and discusses the structure of the cell and the rotation of the protoplasm "from the standpoint of the *principle* of chemical continuity." (Hypothesis — principle: are they synonymous?)

Of course the book is pure speculation, and must not be taken as anything else, though we fear the author does not always remember the sandy foundation on which he is building. The various ingenious diagrams, representing atoms of divers interesting forms and positions lend an air of verisimilitude which might deceive the very elect.

Theory we recognize as necessary; speculation is indispensable in the formation of multiple working hypotheses by the investigator; but it may be seriously doubted whether the publication of a speculation is ever worth while. Until we have more intimate knowledge of the chemistry of proteids, speculation of the kind here set forth must be regarded as little more than vanity and vexation of spirit.—C. R. B.

NOTES FOR STUDENTS.

Continuing his observations on the agencies by which insects are attracted to flowers, Professor J. Plateau now gives a large number made on *Salvia horminum* and *Hydrangea opuloides*,[4] confirming his previous statement that they are chiefly attracted by the sense of sight. Neither the col-

[3] Hörmann, Georg: Die Kontinuität der Atomverkettung ein Strukturprinzip der lebenden Substanz. 8vo. pp. iv + 118. *figs. 32*. Jena: Gustav Fischer. 1899. *M* 3.

[4] Mém. Soc. Zool. de France **11**: 339–375. *fig.* 4. 1898.

ored bracts in the former nor the conspicuous sterile flowers in the latter plant can be regarded as "vexillary." In both cases the pollinating insects make their way at once to the flowers which contain the honey without being visibly guided by the showy organs in either case; while if these are removed it does not appear to make any material difference in the number of insects which visit the inflorescence.— Jour. Roy. Mic. Soc. 1899. 298.

IN A NOTABLE paper on cellulose enzymes, Professor F. C. Newcombe clearly demonstrates the existence of cytohydrolytic enzymes distinct from diastase, especially in the seedlings of white lupine and date palm.[5] These enzymes, which in some plants are doubtless mixed with diastase, "act on starch so feebly and on reserve cellulose so energetically that they are to be regarded as cytase as distinguished from diastase." In all cases the cell walls first become hyaline, then more and more transparent, finally seeming to melt away in solution. Besides the clear proof of the existence of the long suspected cytase, the paper adds much to our knowledge of the distribution of cellulose enzymes.— C. R. B.

DR. A. M. BOUBIER in a brief paper on the pyrenoid[6] states that his observations "prove the existence in pyrenoids of an external plasmic membrane, perfectly differentiated and independent of the chromatophore, at least at its mature stage of development. This membrane encloses a leucoplast, which accumulates starch, with a crystalloid at the center.— C. R. B.

DR. G. HOCHREUTINER has determined experimentally that seeds of a number of aquatic plants may pass uninjured through the alimentary canal of herbivorous fish, and the latter may therefore aid in the dissemination of aquatic plants.[7]— C. R. B.

THE CHIEF VALUE of Kolkwitz's recent paper on the influence of light on the respiration of fungi[8] is due to the refinement of technique employed and the degree of accuracy attained. In these respects it surpasses previous work and eliminates many sources of error that have been neglected. This is the first extensive accurate study of the effect of light upon the respiratory activities of plant protoplasm and of animal protoplasm as well. Animals are prone to move and then by their varying activities to render invalid any conclusions as to the effect of light alone. Severed parts of plants are unsuitable, as diffusion at the cut end is abnormal and quantitatively altered. Fungi having false parenchyma are unsuitable since the intercellular spaces

[5] Annals of Botany 13:49–81. 1899.

[6] Bulletin de l'Herbier Bossier 7:451–458. 1896.

[7] Bulletin de l'Herbier Boissier 7:—. 1899.

[8] KOLKWITZ, R: Ueber den Einfluss des Lichtes auf die Athmung der niederen Pilze: Jahr. f. wiss. bot. 33:129–165.

may suffer change from light. Therefore the author selects such fungi as produce a loosely woven mycelium that spreads itself out openly to the light (Aspergillus, Penicillium, bacteria), and measures such activities as are solely dependent on light. As sources of error he recognized chiefly the evolution of CO_2 through decomposition of oxalic acid or of dead parts, and errors introduced by variation in temperature. The classical method of Pettenkofer (1862) is adopted and the amount of evolved CO_2 is determined by titration with oxalic acid. To secure greater accuracy the gas was forced, not drawn, through the apparatus at the rate of three, four, or five liters per hour as desired. The process and apparatus are described in great detail. Suffice it to say here that exceeding care was given to every feature. The culture vessel, of special design, presented a great surface to the light while of but small capacity. In order to reduce the absorption by glass the walls of the vessel were very thin. The feature wherein this study chiefly surpasses previous work is in the regulation of the temperature of the culture during experimentation. This was accomplished by immersing the culture vessel in a tank containing six liters of water and keeping it at a constant temperature by electricity, automatically regulated by a very ingenious contrivance. Lest the thin layer of water covering the culture flask should vary in temperature all of the water was continually agitated by a paddle operated by a turbine. The inflowing air was warmed to the temperature of the water. In this way the variation was from one tenth to one thirtieth of a degree C. The electric light was constant in quantity and quality, thus avoiding the variations inevitable in the use of sunlight. Estimations of CO_2 were made every two minutes. The author announces as a result of his labors that light, under the conditions employed, increases respiration about 10 per cent. The effect is observable in young or old cultures, richly or poorly nourished fungi, and in acid or alkaline media. The influence of light during long periods when secondary processes arise was not investigated. An excellent bibliography is given.—F. L. STEVENS.

ITEMS OF TAXONOMIC interest are as follows: In continuing his flora of the West Indies (*Symbolæ Antillanæ*), URBAN, in the second part, presents the Araliaceæ, represented by four genera and sixteen species; and in another paper describes about eighty miscellaneous new species, chiefly from Puerto Rico, among which we notice two new genera, *Notodon* (Leguminosæ, near Sabinea) and *Hybosperma* (Rhamnaceæ). LINDAU presents the Polygonaceæ, represented by ten genera and sixty-six species, the great genus Coccoloba containing about fifty of them. SCHLECHTER presents the Asclepiadaceæ, represented by twenty-one genera and eighty-eight species, the largest genus being Metastelma, with thirty-four species, eighteen of which are new. Two new genera are established, *Tainionema* and *Decastelma*.—K. MIYAKE (*Bot. Mag. Tokyo* 13: 1–4. *pl. 3*. 1899) has described a new genus of Hepaticæ,

very closely resembling Pellia. It is said to have a spermatozoid much larger than that of Pellia, which has heretofore been credited with the largest spermatozoids among the Hepaticæ. The new genus is known as *Makinoa* in honor of Makino the discover. Specimens without sporogonia had already been described by Stephani as *Pellia crispata*, so that the name stands as *M. crispata* (St.) Miyaki.— In *Proc. Amer Acad.* (34: 507–534. 1899) ROBINSON and GREENMAN publish revisions of Montanoa, Perymenium, and Zaluzania, long a puzzling series of Mexican and tropical American composites. *Montanoa* is recognized as containing thirty-two species, nine of which are new. *Perymenium* has twenty-six species, ten of which are new; and *Zaluzania* has twelve species, two of which are new. The same authors (*ibid.* 534–566) have published a synopsis of the genus *Verbesina*, which has not been treated as a whole since 1836 (DC. Prodr.), at which time thirty-three species were recognized, all but two being American. Now the genus is conceded to be exclusively American, and contains 109 species, more than 70 per cent. of which are local. The greatest display of species is in the uplands of central and southern Mexico, where 40 per cent. of the species are endemic. In the synopsis twenty-five new species are described.— GREENMAN (*ibid.* 566–576) has published some new and critical Mexican species, the new species numbering twenty.— ELIAS NELSON has published a revision of the phloxes of western North America. He recognizes thirty-eight species, nineteen of which are new. The paper is a master's thesis in the University of Wyoming, and is published in the ninth report of the Wyoming Agricultural College, Laramie, Wyoming.— E. P. BICKNELL, in continuing his studies of Sisyrinchium (*Bull. Torr. Bot. Club* 26: 297–300. 1899), has described four new species from Michigan.— A. A. HELLER (*ibid.* 312–315) has described additional new species from western North America.— AVEN NELSON (Erythea 7: 57–64. 1899) has discussed the western species of *Aragallus* (*Oxytropis*), describing eight new species; and has also described (*ibid.* 65–70) five new forms of Oreocarya, two of Cryptanthe, and one of Allocarya.—JARED G. SMITH (Bull. 18. Div. Agrost. U. S. Depart. Agric.) has published a synopsis of the genus *Sitanion*, recognizing twenty-three species, twenty of which are new.—J. M. C.

GUIGNARD has recently studied the reduction of chromatin in *Naias major*[9]. This plant has proved exceptionally favorable for such a study, since the number of chromosomes, twelve in the sporophyte and six in the gametophyte, is the smallest yet reported for any flowering plant.

First division.—In the prophase the spirem splits longitudinally and then segments into six primary chromosomes each of which consists of two pieces. During the succeeding contraction and growth, each of these pieces shows a

[9] Le développement du pollen et la réduction dans le *Naias major*. Arch. d'anat. microscopique 2: 455–509. 1899.

double row of chromatin granules, a preparation for a second splitting, so that the primary chromosomes are to be regarded as quadruple. As the primary chromosome separates into its two parts (secondary chromosomes), the splitting already inaugurated by the fission of the granules begins to take place, but is not entirely completed, since the two chromosomes remain united at their extremities, thus forming a V with its apex attached to the contractile threads of the spindle. Each daughter nucleus receives six double (secondary) chromosomes.

Second division.—In the second division, six V-shaped chromosomes appear. At the point of the V there is an interruption in the linin support and everything favors the conclusion that these are the secondary chromosomes of the first division which have not lost their individuality. No longitudinal division takes place at this time, there being merely a distribution of the two parts of the V-shaped double chromosome. Thus the two divisions merely distribute the four parts of the primary quadruple chromosome (tetrad), which were already defined in the prophase of the first division. It is evident that there can be no qualitative reduction.

Miss Sargant [10] both figured and described a second fission of the chromatin granules in *Lilium Martagon*, and called attention to the quadruple nature of the primary chromosome. Guignard believes that his results agree with Farmer's account of Pallavicinia, Brauer's of Ascaris, Meves' of Salamandra, and also with Belajeff's description of Iris, although that writer has given a different explanation of the origin of the chromosomes in the pollen mother cell. An excellent review of the chromosome problem, illustrated by very clear diagrams, is by no means the least important part of the work.

The brilliant results of Nawaschin and Guignard on the fertilization of Lilium have been confirmed by Miss Sargant,[11] who finds that during fertilization the male nucleus is applied to the female nucleus, while the second male nucleus is applied to both the polar nuclei. In one case, in which the polar nuclei were not yet in contact, the much elongated "antherozoid" united them like a bridge. In several preparations it was noted that the pollen tube, after fertilization had taken place, contained two small nuclei. Since both generative nuclei are already accounted for, it is suggested that these are probably due to the division of the tube nucleus.—CHAS. J. CHAMBERLAIN.

[10] Ann. Bot. 11: 187–224. 1897.

[11] On the presence of two vermiform nuclei in the fertilized embryo-sac of *Lilium Martagon*. Proc. Royal Soc. 65: 163–165. 1899.